Paper ID: 496
Theme 2. Grassland production and utilization
Sub-theme 2.6. Interdependence of grassland and arable lands for sustainable cereal, forage and livestock production

Yield and quality of perennial forage crops in unconventional lands

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Keywords: Fodder quality, Green forage yield, Nutrient management

Introduction

Livestock rearing is an integral part of rural India. Livestock productivity in India is far below the desired level due to shortage in availability of green fodder for feeding the animals. The health and productivity of livestock mainly depends upon the availability of quality feed and fodders in requisite amount. The need for growing forage crops in unconventional lands is already been in discussion. In the lower Gangetic plains there farmers seldom go for fodder crops and only marginal lands are devoted for such crops. Low lying situations, marshy lands are quite frequent in the delta which may house fodders crops. Proper care to improve upon quality of crops growing in such areas can supplement the deficits of nutrient fodder in this area. Therefore, a field experiment was planned to study the effect of nutrient management on yield and quality of different perennial forage crops in low land situation.

Materials and Methods

Field experiment was conducted at the central research farm (latitude 22^0 58/N, longitude 88^0 31/E and 9.75 m above mean sea level), BCKV, West Bengal during June-October, 2014. Soil of experimental site was sandy loam in texture, having pH 7.2, OC 0.38%, available N, P_2O_5 and K_2O were 228.20, 15.80 and 144.40 kg ha^{-1} respectively. Three perennial grasses (*Brachiaria mutica*, *Brachiaria humidicola* and *Arundo donax*) and four nutrient management practices (control, 50% RDF+FYM @ 5t ha^{-1}, FYM @ 10 t ha^{-1} and 100% RDF) were replicated thrice and laid out in a factorial Randomized Complete Block Design. Recommended dose of fertilizers (RDF) were 120, 60 and 60 kg ha^{-1} N, P_2O_5 and K_2O respectively. A spacing of 50 x 50 cm between rows and plants were maintained. This experiment was started in a one year old experimental plot. Nitrogenous fertilizer top dressed after each cutting. Total three cuts were taken during this period. Observations were recorded on total green forage yield (q ha^{-1}) and dry matter yield (q ha^{-1}) of three cuts. Crude protein concentration was work out by multiplying the Kjeldhal's N value (Jackson, 1973) with 6.25. Crude fibre is the insoluble and combustible organic residue which remained after the sample had been treated under prescribed conditions *i.e.* 1.25% sulphuric acid and sodium hydroxide solution. The digested material was then filtered, washed with hot water and then crude fibre content was determined by calculating the loss in weight after treatment (AOAC, 2007). Crude protein and crude fibre yield (q ha^{-1}) were calculated by multiplying its concentration with dry matter yield. The data were statistically analyzed using analysis of variance for factorial Randomized Complete Block Design as outlined by Gomez and Gomez (1984).

Results and Discussion

Among the different perennial grasses significantly highest green forage yield (476.83 q ha^{-1}) and dry matter yield (190.55 q ha^{-1}) were obtained with *Brachiaria mutica* followed by *Brachiaria humidicola* and *Arundo donax*. Perennial grasses have different growth habit and their response to environment is different. Differences in green forage yield and dry matter yield were due to differences in the growth habit and morphology which differentiate grass in biomass production from one another (Ullah *et al.*, 2006). With respect to quality characters, significantly more crude protein yield (15.67 q ha^{-1}) as well as crude fibre yield (67.85 q ha^{-1}) was recorded with *Brachiaria mutica* as compared to others. The maximum in crude protein and crude fibre yield with *Brachiaria mutica* may due to be the higher dry matter yield was obtained with this crop.

The green forage yield, dry matter yield, crude protein and crude fibre yield varied significantly due to different nutrient management. Application of 100% recommended dose of fertilizers significantly increased the fodder yield of perennial grasses from 278.72 to 322.94 q ha^{-1} over absolute control (Table 1). Application of 50% RDF+FYM @ 5 t ha^{-1} and 100% RDF were statistically at par for green forage yield but all the nutrient management treatments were significantly superior over control. Application of FYM @ 10 t ha^{-1} gave significantly higher dry matter yield (129.45 q ha^{-1}). The variation in sequence of green forage yield and dry matter yield might be due variation in leaf succulence for applying varying source

of nutrients. Highest crude protein yield was recorded with the application of 100% RDF. The increase in crude protein yield might be due to balance application of nutrient resulting in better absorption of water and nitrogen. Crude fibre is one of the most important parameter influencing the quality of fodder crops. The higher the crude fibre contents lower will be the digestibility. It is obvious from the data given in Table 1 that the application of 100% RDF reduced crude fibre content and the crude fibre yield highest with the application of FYM @ 10 t ha^{-1} as it produce highest dry matter.

Table 1: Effect of nutrient management on different attributes of perennial forage crops

Treatments	Green forage yield (q ha^{-1})	Dry matter yield (q ha^{-1})	Crude protein content (%)	Crude protein yield (q ha^{-1})	Crude fibre content (%)	Crude fibre yield (q ha^{-1})
Perennial forage crops						
G_1 (*Brachiaria mutica*)	476.83	190.55	8.16	15.67	35.78	67.85
G_2 (*Brachiaria humidicola*)	267.58	87.70	6.40	5.62	32.97	28.90
G_3 (*Arundo donax*)	173.88	70.24	7.57	5.42	35.68	24.94
SEm (±)	3.91	2.31	0.05	0.17	0.26	0.94
CD (0.05)	11.46	6.78	0.16	0.50	0.76	2.77
Nutrient management						
N_1 (Control)	278.72	97.18	6.26	6.40	36.16	35.50
N_2 (50% RDF+FYM @ 5 t ha^{-1})	313.33	116.43	6.90	8.27	34.89	40.72
N_3 (FYM @ 10 t ha^{-1})	309.39	129.45	7.81	10.37	34.24	44.67
N_4 (100% RDF)	322.94	121.59	8.54	10.58	33.95	41.36
SEm (±)	4.51	2.67	0.06	0.20	0.30	1.09
CD (0.05)	13.23	7.83	0.18	0.58	0.88	3.20

Table 2: Correlation coefficients of different traits of forage crops

Characters	Green forage yield	Dry matter yield	Crude protein content	Crude protein yield	Crude fibre content	Crude fibre yield
Green forage yield	1.000					
Dry matter yield	0.965**	1.000				
Crude protein content	0.404	0.511	1.000			
Crude protein yield	0.919**	0.981**	0.650*	1.000		
Crude fibre content	0.084	0.117	-0.018	0.097	1.000	
Crude fibre yield	0.962**	0.995**	0.499	0.971**	0.213	1.000

**significant at 1% level *significant at 5% level

In the present investigation correlation coefficient were worked out between six characters for the data of twelveobservations. All the characters except crude protein content and crude fibre content had positive significant association with green fodder yield and dry matter yield. While, the weak correlation was found with crude protein content and crude fibre content (Table 2). It indicates that yield of grasses can be predicted well with the crude protein yield and crude fibre yield. Crude protein content showed a negative and non-significant correlation with crude fibre content.

Conclusion

Based on the yield and quality *Brachiaria mutica* could be effectively cultivated in low land situation of the Ganges delta with the application of 100% RDF.

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